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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]In this invention, it is related with the wrapping and the container which used an oxygen uptake nature resin composition and it.

Therefore, it is related with the oxygen uptake nature resin composition which can control more the oxygen penetration which lets a container wall pass stably over a long period of time in details.

[0002]

[Description of the Prior Art]Although a metal can, a glass bottle, various plastic containers, etc. are conventionally used as a container, the deterioration of contents and the flavor fall by the oxygen which remains in a container, or the oxygen which penetrates a container wall pose a problem.

[0003]In particular, in the metal can or the glass bottle, to the oxygen penetration which lets a container wall pass being zero, and only the oxygen which remains in a container being a problem, in the case of a plastic container, it produces to the order which the oxygen penetration which lets a container wall pass cannot disregard, and has been a problem in respect of the preservability of a contents article.

[0004]making a container wall into multilayer structure in a plastic container, in order to prevent this -- the inside of it -- at least -- much more -- carrying out and using the resin which has acid-proof matter permeability, such as an ethylene-vinylalcohol copolymer, is performed.

[0005]In order to remove oxygen in a container, as an example which use of the deoxidant is also performed for many years and applied this to the container wall, There is an invention of JP,62-1824,B, and according to this, the layer which blends the deoxidant which uses reducing substances, such as iron powder, as base resin with the resin which has oxygen permeability,

and the layer which has oxygen gas interception nature are laminated, and it is considered as the multilayer-structure thing for a package.

[0006]In JP, 1-278344, A concerning this invention person's etc. proposal. The oxygen permeability coefficient in 20 °C and 0%RH is below 10^{-12} cc-cm/cm² and sec-cmHg, and the amount of water adsorption in 20 °C and 100%RH to the gas-barrier-property thermoplastics which is 0.5% or more the organometallic complex of a transition metal. The blended resin composition is made into an interlayer and the plastic multilayered container comprising the laminated-structure thing which provided the layer of damp-proof plastic resin in this interlayer's both sides is indicated.

[0007]In the barrier for a package containing the layer of the constituent which changes from polymer to the Patent Publication Heisei No. 500846 [two to] gazette, and has the oxygen catching characteristic, or this constituent, the barrier for a package, wherein a constituent catches oxygen by metal catalyst oxidation of the organic component which can be oxidized is indicated.

As an organic component which can be oxidized, it is also indicated that polyamide, especially xylylene group content polyamide are used.

[0008]

[Problem(s) to be Solved by the Invention]Although it can be satisfied with the point that the method of blending oxygen absorbents, such as iron powder, with resin, and using for the container wall of wrapping has large oxygen uptake performance, in order to color resin peculiar hue, the field of the package as which transparency is required has the restrictions on the use that it cannot be used.

[0009]Although it has the advantage that on the other hand the oxygen uptake nature resin composition containing a transition metal system catalyst is applicable also to the container which is parenchyma top transparence, since the base material resin which blended the transition metal system catalyst deteriorates by oxidation, the oxygen penetration which lets a container wall pass passes, and there is a fault of becoming large by the time.

[0010]Polyamide resin was the resin which was excellent in oxygen barrier property in itself, and this invention persons noted giving oxygen uptake nature to this resin layer, without spoiling this oxygen barrier property. As a result, it found out that reduction became possible over a long period of time about the oxygen penetration which lets this resin composition pass by blending an oxidizing organic component and a transition metal system catalyst with polyamide resin. That is, the purpose of this invention combines oxygen barrier property and oxygen uptake nature, and is to provide the oxygen uptake nature resin composition which can reduce the oxygen penetration which lets the layer of a resin composition pass over a long period of time. The oxygen barrier property outstanding with polyamide resin is held, and other

purposes of this invention are to provide the oxygen uptake nature resin composition of the functional discrete type in which oxygen uptake nature was revealed by the oxidizing organic component. The purpose of further others of this invention has the oxygen absorption rate and oxygen uptake capacity which improved, and is excellent also in transparency and is to provide an oxygen uptake nature resin composition applicable to the use of extensive wrapping and a container.

[0011]

[Means for Solving the Problem]According to this invention, polyamide resin, an oxidizing organic component, and a transition metal system catalyst are contained, and an oxygen uptake nature resin composition characterized by things is provided. It is polyamide resin in which terminal amino group concentration exceeds [1. polyamide resin / terminal amino group concentration] $50\text{eq}/10^6\text{g}$ much more suitably in an oxygen uptake nature resin composition of this invention in more than $40\text{eq}/10^6\text{g}$, 2. Polyamide resin is the polyamide derived from a diamine component which makes xylylene diamine a subject, and a dicarboxylic acid component, 3. Oxidizing organic components are a polymer derived from polyenes, especially an acid denaturation polyene system polymer, 4. 5. oxidizing organic component contains [that a transition metal system catalyst is carboxylate of cobalt,] in 0.01 thru/or 10% of the weight of quantity by a resin composition standard, 6. A transition metal system catalyst is a resin composition standard, and containing [in quantity of 100 thru/or 3000 ppm]-by the amount conversion of transition metals ** is preferred. According to this invention, wrapping and a container by which at least one layer which consists of the above-mentioned oxygen uptake nature resin compositions being included further are provided.

[0012]

[Embodiment of the Invention][Function] -- polyamide resin is used as a substrate, and oxygen uptake nature can be made it to be the feature to have blended the oxidizing organic component and the transition metal system catalyst with this, and to reveal in the oxygen uptake nature resin composition of the present invention, without producing the fall of the oxygen barrier property by the oxidation degradation of polyamide resin

[0013]With the publicly known oxygen uptake nature resin composition of a polyamide resin-transition metal system catalyst, when polyamide resin receives oxidation, absorption of oxygen is performed and the oxygen transmittance of the resin layer itself shows the increasing tendency in connection with the oxidation degradation of this polyamide resin. On the other hand, in the oxygen uptake nature resin composition of this invention. It becomes possible to make oxygen uptake nature reveal of a polyamide resin substrate, without an oxidizing organic component producing the fall of the oxygen barrier property by the oxidation degradation of polyamide resin, without oxidizing on parenchyma, since oxygen uptake is chiefly performed by this in response to oxidation.

[0014]It is actually composition (12microPET, a 20micro barrier material, 50microCPP, conditions (95 **)). The constituent in which boiling treatment and terminal amino group (AEG) concentration blended 400 ppm of cobalt system catalysts with meta-xylylene system polyamide resin of $27\text{eq}/10^6\text{g}$ by cobalt volume conversion for 30 minutes, About the constituent which blended 5 % of the weight and 400 ppm of cobalt system catalysts by cobalt volume conversion, terminal amino group (AEG) concentration an oxidizing organic component (acid denaturation diene system polymer) to meta-xylylene system polyamide resin of $87\text{eq}/10^6\text{g}$. As opposed to the oxygen transmission quantity after 30-day temporality being 0.31 cc / cup in the former resin composition, if aging of oxygen transmission quantity is investigated, With the latter constituent, it is below 0.01 cc / cup, and the oxygen penetration which lets a container wall pass can be controlled remarkably low irrespective of prolonged temporality with the oxygen uptake nature resin composition of this invention. maintenance of the oxygen barrier property according [this effect of this invention] to polyamide resin, and the manifestation of the oxygen uptake nature by an oxidizing organic component -- a function -- it is thought that it is because it is carried out schismatically. Drawing 1 shows the relation between the terminal amino group concentration of meta-xylylene system polyamide resin, and oxygen absorption rate, The constituent which blended 400 ppm of neo decanoic acid cobalt with the meta-xylylene system polyamide resin in which terminal amino group concentration differs by cobalt conversion is fabricated on a 20-micrometer-thick film, After putting this film into the container of 22 ** and high RETOFU REXX whose humidity was controlled to RH 60% and which is mentioned later and keeping it for seven days, an oxygen density is measured using gas chromatography and it asks for oxygen absorption rate. In the range of $10 - 30\text{eq}/10^6\text{g}$, the oxygen absorption rate of this polyamide resin has the large terminal amino group concentration of this polyamide resin, and oxidation degradation is promoted. On the other hand, terminal amino group concentration is [the oxygen absorption rate of this polyamide resin] 0 in the range of $50 - 70\text{eq}/10^6\text{g}$, and it is shown that oxidation degradation has not happened at all.

[0015]In this invention, terminal amino group concentration of polyamide resin is [more than $40\text{eq}/10^6\text{g}$] preferred at the point that it controls the oxidation degradation of polyamide resin that it is polyamide resin in which terminal amino group concentration exceeds $50\text{eq}/10^6\text{g}$ much more suitably.

[0016]According to this invention persons' research, it turned out that there is a relation with close the oxidation degradation of polyamide resin, i.e., oxygen uptake, and terminal amino group concentration of polyamide resin. Namely, in being in the comparatively high range which the terminal amino group concentration of polyamide resin mentioned above, if the terminal amino group concentration of polyamide resin comes to be less than a mentioned

range to being controlled by the value almost near zero or zero, as for oxygen absorption rate, the oxygen absorption rate of polyamide resin will increase. In this way, according to this invention, it becomes possible to make the oxygen uptake by an oxidizing organic component perform selectively, controlling the oxidation degradation of polyamide resin by using the combination of polyamide resin of a mentioned range, and an oxidizing organic component.

[0017]As for the polyamide resin used for this invention, it is preferred that it is the polyamide derived from the diamine component which makes xylylene diamine a subject, and the dicarboxylic acid component in respect of oxygen barrier property. That is, the above-mentioned xylylene group content polyamide resin has the advantage that oxygen permeability is small, as compared with all the aliphatic polyamide resin.

[0018]As for the oxidizing organic component used for this invention, it is preferred that they are the polymer derived from polyenes, especially an acid denaturation polyene system polymer. The polymer derived from polyenes has a double bond in the main chain in a polymer, or the side chain. According to the theory of Smith, it is easy to be activated remarkably and the carbon atom which adjoins a double bond is supposed that hydrogen gas is emitted easily. With the polymer derived from polyene, drawing of a hydrogen atom is easily performed in the position of the carbon atom which adjoins the carbon-carbon double bond in a polymer, and it is thought that a radical occurs by this. The oxygen uptake in the constituent containing a transition metal system catalyst and the above-mentioned oxidizing organic component, It is carried out via oxidation of this organic component with a natural thing, and this oxidation, ** radical generating by the drawing of the hydrogen atom from the double bond contiguity carbon atom by a transition metal system catalyst, and ** -- peroxy by addition of the oxygen molecule to this radical -- it is believed that it produces through each elementary process of radical generating and the drawing of the hydrogen atom by ** peroxy radical.

[0019]However, under coexistence of a small amount of transition metal catalysts which do not produce degradation of resin in a normal state, either, there is an induction period in generating of the above-mentioned radical, and addition of oxygen, and it is thought that these elementary processes are not necessarily performed promptly and effectively. On the other hand, in the acid denaturation polyene polymer suitably used by this invention, in addition to the above-mentioned double bond contiguity carbon atom, it has functional groups, such as a carboxylic acid group and carboxylic anhydride groups, and it is believed that it is useful effective in shortening of said induction period. That is, probably said each of functional groups is bases of electronic suction nature, and it is the reason to activate said double bond contiguity carbon atom.

[0020]In addition, if an acid denaturation polyene polymer is blended with polyamide resin, the very convenient operation that the dispersibility of the acid denaturation polyene system polymer to a polyamide resin matrix improves, and the processability of a resin composition

improves will be attained. That is, in order to distribute a polyene system polymer by only mechanical kneading in the case of an undenaturalized polyene system polymer, it does not escape that there is a tendency for dispersibility to become what also has an uneven grade of distribution easily badly, and the processability of a resin composition also falls. On the other hand, in an acid denaturation polyene system polymer, the advantage of the compatibility over polyamide resin being size, and the dispersibility over polyamide resin being good, and excelling also in the processability of a resin composition by existence of the functional group mentioned above is attained.

[0021]so that it is desirable in respect of oxygen uptake nature, this catalyst is excellent in the dispersibility to the inside of resin and it becomes unsightly in this invention that a transition metal system catalyst is carboxylate of cobalt about wrapping -- **** -- it excels also in the point of not coloring.

[0022]It is preferred that the oxidizing organic component contains in 0.5 thru/or 8% of the weight of quantity 0.01 thru/or 10% of the weight by the resin composition standard especially in this invention. If the quantity of an oxidizing organic component is less than a mentioned range, the rate of absorption of oxygen comes to fall considerably as compared with the case where it is in a mentioned range, and is not preferred. On the other hand, if the quantity of an oxidizing organic component exceeds a mentioned range, an exceptional advantage will not be acquired in respect of oxygen absorption rate, and since the oxygen transmittance which lets the layer of an oxygen uptake nature resin composition pass becomes large and a moldability worsens, it is not desirable.

[0023]on the other hand -- a transition metal system catalyst -- a resin composition standard -- and the thing for which 100 thru/or 3000 ppm is especially contained in the quantity of 150 thru/or 1000 ppm by the amount conversion of transition metals -- it is desirable. Since the deterioration tendency of resin will become remarkable if it comes to fall considerably as compared with the case where oxygen absorption rate is in a mentioned range when the quantity of a transition metal system catalyst is less than a mentioned range and this quantity exceeds a mentioned range, it is not desirable.

[0024][Polyamide resin] as polyamide resin, (a) The aliphatic series derived from the dicarboxylic acid component and the diamine component, alicycle fellows or semi aromatic polyamide, and (b) The polyamide derived from aminocarboxylic acid or its lactam, these copoly amide, or such mixed material are mentioned. As a dicarboxylic acid component, aromatic dicarboxylic acid, such as the aliphatic dicarboxylic acid of the carbon numbers 4 thru/or 15 and terephthalic acid of succinic acid, adipic acid, sebacic acid, decane dicarboxylic acid, undecane dicarboxylic acid, dodecane dicarboxylic acid, etc., and isophthalic acid, is mentioned, for example. As a diamine component, it is 1,6 - Diaminohexan, 1,8-diaminooctane, 1,10 - a diaminodecane and 1,12 - the carbon numbers 4-25, such as a

diaminododecane, -- especially -- the straight chain shape or branched-chain alkylene diamine of 6-18. Bis(aminomethyl)cyclohexane, bis(4-aminocyclohexyl)methane, 4, 4' - Diamino-3,3' - Dimethyl dicyclohexyl methane, Aromatic aliphatic diamine, such as alicyclic fellows diamine, such as bis(4-aminocyclohexyl)methane, 1,3-bis(aminocyclohexyl)methane, and 1,3-bis(aminomethyl)cyclohexane, m-xylylene diamine, and/or p-xylylene diamine, is mentioned especially. As an aminocarboxylic acid ingredient, aliphatic series aminocarboxylic acid, for example, omega-aminocaproic acid, Aromatic aliphatic series aminocarboxylic acid, such as omega-aminooctanoic acid, omega-aminoundecanoic acid, and omega-aminododecanoic acid, for example, ****- aminomethyl benzoic acid, ****- aminophenyl acetic acid, etc., etc. can be mentioned.

[0025]Also among such polyamide, for the purpose of this invention, xylylene group content polyamide is preferred, and for it specifically, Polymetaxylylene adipamide, polymetaxylylene SEBAKAMIDO, polymetaxylylene SUBERAMIDO, Homopolymers, such as polyparaxylylene PIMERAMIDO and polymetaxylylene AZERAMIDO, And the meta-xylylene / PARAKI silylene adipamide copolymer, a metaxylylene-paraxylylene pimelamide copolymer, Copolymers, such as meta-xylylene / PARAKI silylene SEBAKAMIDO copolymer, meta-xylylene / PARAKI silylene AZERAMIDO copolymer, Or the aliphatic diamine like an ingredient and hexamethylenediamine of these homopolymers or a copolymer, The alicyclic diamine like a piperazine, the aromatic diamine like Para -**** (2 aminoethyl) benzene, Although the copolymer which carried out copolymerization of the aromatic aminocarboxylic acid like the aromatic dicarboxylic acid like terephthalic acid, the lactam like epsilon caprolactam, omega-aminocarboxylic acid like 7-aminoheptanoic acid, and ****- aminomethyl benzoic acid, etc. is mentioned, The diamine component which uses m-xylylene diamine and/or p-xylylene diamine as the main ingredients, The polyamide obtained from aliphatic dicarboxylic acid and/or aromatic dicarboxylic acid can use conveniently especially. By such xylylene group content polyamide, it excels in oxygen barrier property as compared with other polyamide resin, and is desirable for the purpose of this invention.

[0026]As for the polyamide resin used for this invention, it is preferred to have the terminal amino group concentration of the range mentioned above. If terminal amino group concentration is less than a mentioned range, since degradation of polyamide resin will arise, it is not desirable.

[0027]The polyamide resin which has terminal amino group concentration in said within the limits can be chosen from resin of commercial polyamide resin, and can be used. As for these polyamide resin, it is desirable 1.3 thru/or 4.2, and for the relative viscosity (etarel) measured at the concentration of 1.0 g/dl and the temperature of 20 ** among 98% sulfuric acid to be especially within the limits of 1.5 thru/or 3.8 from the mechanical property of a container and the ease of processing.

[0028][Oxidizing organic component] As for the oxidizing organic component used for this invention, it is preferred that it is a polymer derived from polyene. The resin which includes the unit derived from polyene with 4-20 carbon atoms, a chain thru/or annular conjugate, or disconjugate polyene as this polyene is used suitably. As these monomers, for example Conjugated diene;1,4-hexadienes, such as butadiene and isoprene, 3-methyl-1,4- Hexadiene, 4-methyl- 1,4 - Hexadiene, 5-methyl-1,4- Hexadiene, 4,5-dimethyl- 1,4 - Hexadiene, 7-methyl- 1,6- chain nonconjugated diene, such as octadien; Methyl tetrahydro indene, 5-ethylidene-2- Norbornene, 5-methylene- 2 - Norbornene, 5-isopropylidene-2- Norbornene, 5-vinylidene- 2 - Norbornene, 6-chloromethyl 5- isopropenyl-2- Annular nonconjugated diene;2,3-diisopropylidene- 5, such as norbornene and a dicyclopentadiene - Norbornene, 2-ethylidene-3-isopropylidene-5- Norbornene, 2-propenyl- 2,2 - Trien, such as norbornadiene, chloroprene, etc. are mentioned.

[0029]Such polyenes are independent, are two or more sorts of combination, or are included in the form of a homopolymer, a random copolymer, a block copolymer, etc. in combination with other monomers. As polyene and a monomer used in combination, The numbers 2-20alpha of carbon atoms - An olefin, for example, ethylene, propylene, 1-butene, 4-methyl- 1 - A pentene, 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, 1-undecene, 1-dodecen, 1-tridecenoic, 1-tetra decene, 1-pentadecene, 1-hexa decene, 1-heptadecene, 1-nonadecen, 1-eicosen, 9-methyl- 1 - Decene, 11- Methyl-1- Dodecen, 12 - Ethyl- 1 - Tetra decene is mentioned and, otherwise, it is usable in monomers, such as styrene, vinyltoluene, acrylonitrile, a methacrylonitrile, vinyl acetate, methyl methacrylate, and ethyl acrylate.

[0030]As a polyene system polymer, specifically Polybutadiene (BR), Although polyisoprene (IR), isobutylene isoprene rubber (IIB), crude rubber, nitril butadiene rubber (NBR), a styrene butadiene rubber (SBR), chloroprene rubber (CR), ethylene propylene diene rubber (EPDM), etc. can be mentioned, It is not limited to these examples.

[0031]The carbon-carbon double bond in particular in a polymer is not limited, but may exist in a main chain in the form of a vinylene group, or may exist in the side chain in the form of a vinyl group.

[0032]As for these polyene system polymers, it is preferred that a carboxylic acid group, carboxylic anhydride groups, and a hydroxyl group are introduced. As a monomer used for introducing these functional groups, the ethylene system unsaturated monomer which has the above-mentioned functional group is mentioned.

[0033]. [as these monomers] [using unsaturated carboxylic acid or these derivatives] [desirably and specifically] [bicyclo / alpha, such as acrylic acid, methacrylic acid, maleic acid, boletic acid, itaconic acid, citraconic acid, and tetrahydrophtal acid, beta-unsaturated carboxylic acid, and] 2, [2, 1] Bicyclo [alpha, such as unsaturated carboxylic acid, such as hept 2-ene- 5,6-dicarboxylic acid, a maleic anhydride, itaconic acid anhydride, anhydrous

citraconic acid, and tetrahydro phthalic anhydride, beta unsaturated carboxylic acid anhydride,] 2, [2, 1] The anhydride of unsaturated carboxylic acid, such as a hept 2-ene- 5,6-dicarboxylic anhydride, is mentioned.

[0034]Although the acid denaturation of a polyene system polymer makes base polymer the resin which has a carbon-carbon double bond and is manufactured by carrying out the graft copolymerization of unsaturated carboxylic acid or its derivative to this base polymer by a publicly known means in itself, It can manufacture also by carrying out random copolymerization of the polyene mentioned above, unsaturated carboxylic acid, or its derivative.

[0035]As for the especially suitable acid denaturation polyene system polymer for the purpose of this invention, it is preferred to contain unsaturated carboxylic acid thru/or its derivative in% of the amount of 0.01 thru/or 10 mol. If the content of unsaturated carboxylic acid thru/or its derivative is in the above-mentioned range, the distribution to polyamide resin of an acid denaturation polyene system polymer will become good, and absorption of oxygen is also performed smoothly. The hydroxyl group denaturation polyene system polymer which has a hydroxyl group can also be used for an end good.

[0036]As for the polyene system polymer used for this invention, it is preferred that the viscosity at 40 °C is in the range of 1 thru/or 200 Pa·s in respect of the processability of an oxygen uptake nature resin composition.

[0037][Transition metal system catalyst] as a transition metal system catalyst used for this invention, although periodic table metal of the 8th group ingredients, such as iron, cobalt, and nickel, are preferred -- others -- the 1st, such as copper and silver, -- the metallic component of VII fellows, such as a VI group, manganese, etc., such as the Vth fellows of metals of the 4th group, such as group metal:tin, titanium, and a zirconium, and vanadium and chromium, can be mentioned. Also among these metallic components, oxygen absorption rate of a cobalt component is large, and it is suitable for especially the purpose of this invention.

[0038]Generally a transition metal system catalyst is used in the form of the inorganic acid salt of a low valence of the above-mentioned transition metal, organic acid salt, or complex salt. As an inorganic acid salt, inorganic oxy acid salts, such as an oxy acid salt of nitrogen, such as an oxy acid salt of sulfur, such as halide, such as a chloride, and sulfate, and a nitrate, and an phosphate, a silicate, etc. are mentioned. On the other hand, although carboxylate, a sulfonate, phosphonate, etc. are mentioned as organic acid salt, Carboxylate is suitable for the purpose of this invention, and as the example, Acetic acid, propionic acid, isopropionic acid, butanoic acid, isobutanoic acid, Pentanoic acid, isopentanoic acid, hexanoic acid, heptanoic acid, isoheptanoic acid, Octanoic acid, 2-ethylhexanoic acid, nonanoic acid, 3,5,5-trimethylhexanoate, Decanoic acid, neo decanoic acid, undecanoic acid, lauric acid, myristic acid, Transition metal salt, such as palmitic acid, margaric acid, stearic acid, arachidic acid,

Linder acid, tsuzuic acid, a petroselinic acid, oleic acid, linolic acid, linolenic acid, arachidonic acid, formic acid, oxalic acid, sulfamic acid, and naphthenic acid, is mentioned. On the other hand, as a complex of a transition metal, it is used by the complex with beta-diketone or beta-keto acid ester, and as beta-diketone or beta-keto acid ester, For example, an acetylacetone, ethyl acetoacetate, 1,3-cyclohexa dione, Methylenebis 1,3-cyclohexa dione, 2-benzyl-1,3-cyclohexa dione, Acetyl tetralone, palmitoyl tetralone, stearoyl tetralone, Benzoyl tetralone, 2-acetylcyclohexanone, 2-benzoylcyclohexanone, A 2-acetyl-1,3-cyclohexanedione, benzoyl-p-KURORU benzoylmethane, Bis(4-methylbenzoyl)methane, bis(2-hydroxybenzoyl)methane, A benzoylacetone, TORIBENZO yl methane, diacetylbenzoylmethane, Stearoyl benzoylmethane, palmitoyl benzoylmethane, lauroyl benzoylmethane, Dibenzoylmethane, bis(4-KURORU benzoyl)methane, bis(methylene-3,4-dioxybenzoyl)methane, a benzoylacetyl phenylmethane, stearoyl (4-methoxy benzoyl) methane, butanolyacetone, JISUTE aroyl methane, An acetylacetone, stearoyl acetone, bis(cyclohexa noil)-methane, dipivaloyl methane, etc. can be used.

[0039][Oxygen uptake nature resin composition] In the oxygen uptake nature resin composition of this invention, it is preferred that the oxidizing organic component contains in 0.5 thru/or 8% of the weight of quantity especially 0.01 thru/or 10% of the weight on the basis of a resin composition. In the resin composition of this invention, a transition metal system catalyst is a resin composition standard, It is preferred as an amount of transition metals to contain at 100 thru/or 800 ppm with cobalt, to contain at 150 thru/or 1500 ppm with iron, and to specifically contain in the quantity of 200 thru/or 2000 ppm with manganese 100 thru/or 3000 ppm.

[0040]Various means can be used in order to blend an oxidizing organic component and a transition metal system catalyst with polyamide resin. There is no exceptional order in this combination, and it may blend in arbitrary order. For example, both mixed material can be easily prepared by dry-type-blending or melt blending an oxidizing organic component at polyamide resin. On the other hand, as compared with polyamide resin or an oxidizing organic component, since a transition metal system catalyst is little, In order to blend homogeneously, it is good to dissolve a transition metal catalyst in an organic solvent generally, to mix this solution, powder or granular polyamide resin, and an oxidizing organic component, and to dry this mixture under an inert atmosphere as occasion demands.

[0041]As a solvent in which a transition metal system catalyst is dissolved, methanol, ethanol, Alcoholic solvent, such as butanol, wood ether, diethylether, Ether system solvents, such as methyl ethyl ether, a tetrahydrofuran, and dioxane, It is good to use by the concentration that hydrocarbon system solvents, such as ketone solvent, such as methyl ethyl ketone and cyclohexanone, n-hexane, and cyclohexane, can be used, and generally the concentration of a transition metal system catalyst will be 5 thru/or 90 % of the weight.

[0042]Mixing of polyamide resin, an oxidizing organic component, and a transition metal

system catalyst and subsequent preservation are good to carry out in a non-oxidizing atmosphere so that oxidation on the preceding paragraph story of a constituent may not arise. Mixing or desiccation under decompression or in a nitrogen air current is preferred for this purpose. This mixing and desiccation can be performed on the preceding paragraph story of a forming cycle using a vent type, or an extrusion machine and a catapult with a dryer. The masterbatch of the polyamide resin which contains a transition metal system catalyst by comparatively high concentration, and/or an oxidizing organic component is prepared, a dry type blend can be carried out with the polyamide resin in which this masterbatch is not blended, and the oxygen uptake nature resin composition of this invention can also be prepared. The polyamide used for this invention is 120 thru/or 180 ** in temperature which is a general drying condition, and is good to use for shaping which is dried for 2 thru/or 6 hours and is later mentioned under decompression of 0.5 thru/or 2mmHg.

[0043]Although it generally is not required for the oxygen uptake nature resin composition of this invention, a publicly known activator can be blended in itself by request. Although the suitable example of an activator is not limited to this, they are a hydroxyl group and/or carboxyl group containing polymers, such as a polyethylene glycol, a polypropylene glycol, an ethylene vinyl alcohol copolymer, an ethylene methacrylic acid copolymer, and various ionomers. 30 or less weight sections per polyamide resin 100 weight section of of especially these hydroxyl groups and/or carboxyl group containing polymers can be blended in the quantity of 0.01 thru/or 10 weight sections. In the oxygen uptake nature resin composition used for this invention, a bulking agent, colorant, heat-resistant stabilizer, Publicly known resin combination drugs, such as lubricant, such as weathering stabilizer, an antioxidant, an antiaging agent, light stabilizer, an ultraviolet ray absorbent, a spray for preventing static electricity, metal soap, and a wax, resin for refining, or rubber, can be blended according to a publicly known formula in itself. For example, intrusion of resin to a screw is improved by blending lubricant. As lubricant, metal soap, such as magnesium stearate and calcium stearate, A flow, nature or synthetic paraffin, micro wax, polyethylene wax, The thing of the hydrocarbon system of chlorination polyethylene wax etc., stearic acid, The thing of fatty acid systems, such as lauric acid, octadecanamide, the Barh Myzin acid amide, Oleic amide, an ESHIRU acid amide, methylenebis stearamide, The thing of fatty acid monoamide systems, such as ethylene-bis-stearamide, or a bisamide system, Generally the things of the alcohol system of the thing of ester systems, such as butyl stearate, hydrogenated castor oil, and ethylene glycol monostearate, cetyl alcohol, stearyl alcohol, etc. and those mixed stock are used. The range of 50 thru/or 1000 ppm is suitable for the addition of lubricant on a polyamide standard.

[0044][Wrapping and container] The oxygen uptake nature constituent of this invention can be filled up with the form of powder, granular material, or a sheet into the bag which comprises the resin films, the papers, the textile fabrics and the nonwoven fabrics which have oxygen

permeability, or these layered products, and can be used for the oxygen uptake of the sealed package inside of the body. The oxygen uptake nature constituent of this invention can be blended into a liner thru/or the object for gaskets, or resin for covering formation and rubber, and can also be used for the remains oxygen uptake in a packed body. However, as for the oxygen uptake nature resin composition of this invention, it is preferred especially to use as a container in the form of the cup as wrapping, a tray, a bottle, a tube vessel, etc. by the form of a film and a sheet.

[0045]that is, the oxygen uptake nature resin composition of this invention comprises this oxygen uptake nature resin composition not to mention the ability to use it as wrapping and a container in the form of a monolayer -- at least -- much more -- it can be used as wrapping and a container in the form of laminated material much more at least that consists of other resin. Generally, as for the oxygen uptake nature resin composition of this invention, it is preferred to provide inside the outside surface of a container etc. so that it may not expose to the outside surface of a container etc., and it is the purpose of avoiding the direct contact with contents, and providing outside internal surfaces, such as a container, is preferred. It is desirable to use an oxygen uptake nature resin composition as at least one interlayer of multilayer resin wrapping or a container in this way.

[0046]In the case of the wrapping of multilayered constitution, and a container, as other resin layers combined with the oxygen uptake nature resin composition layer of this invention, olefin system resin, thermoplastic polyester resin, barrier property resin, etc. are mentioned. As olefine resin, low density polyethylene (LDPE), medium density polyethylene (MDPE), High density polyethylene (HDPE), linear low density polyethylene (LLDPE), Polyethylene (PE), such as line ultra low density polyethylene (LULDPE), Polypropylene (PP), ethylene propylene rubber, the polybutene 1, an ethylene-butene-1 copolymer, A propylene-butene-1 copolymer, an ethylene-propylene-butene-1 copolymer, an ethylene-vinylacetate copolymer, ion bridge construction olefine copolymers (ionomer), or such mixed material are mentioned. As thermoplastic polyester resin, polyethylene phthalate (PET), polybutylene terephthalate (PBT), polyethylenenaphthalate (PEN) or these copolymerized polyester, such mixed material, etc. are mentioned. As most suitable example of gas-barrier-property resin, An ethylene-vinylalcohol copolymer (EVOH) can be mentioned, For example, more than 96 mol % and the copolymer saponification thing saponified and obtained so that it may become more than 99 mol % especially are especially used [an ethylene content] for the degree of saponification 20 thru/or 60-mol% in 25 thru/or 50-mol the ethylene-vinylacetate copolymer which is %. This ethylene vinyl alcohol copolymer saponification thing, It is desirable that should have a molecular weight which is sufficient for the ability of a film to be formed, generally measure at 30 ** among the mixed solvent of 85:15 by the weight ratio of phenol:water, and more than 0.01 dl/g has the viscosity more than 0.05 dl/g especially. As other examples of barrier

property resin, a cyclic olefin system copolymer (COC), APEL of especially the copolymer of ethylene and cyclic olefin, especially the Mitsui Chemicals, Inc. make, etc. can be used again. [0047]The suitable example of the laminated structure for wrapping and containers expresses the oxygen uptake nature resin composition of this invention as OAR, and is as follows. It can be freely chosen for the purpose which layer is made into the inner surface side.

Two-layer structure :P ET/OAR, PE/OAR, PP/OAR, three layer systems :P E/OAR/PET, PET/OAR/PET, PE/OAR/PP, EVOH/OAR/PET, PE/OAR/COC, four layer systems :P E/PET/OAR/PET, PE/OAR/EVOH/PET, PET/OAR/EVOH/PET, PE/OAR/EVOH/COC, five layer systems :P ET/OAR/PET/OAR/PET, PE/PET/OAR/EVOH/PET, PET/OAR/EVOH/COC/PET, PET/OAR/PET/COC/PET, PE/OAR/EVOH/COC/PET, Six layer systems :P ET/OAR/PET/OAR/EVOH/PET, PE/PET/OAR/COC/EVOH/PET, PET/OAR/EVOH/PET/COC/PET, seven layer systems :P They are ET/OAR/COC/PET/EVOH/OAR/PET.

[0048]Adhesive resin can also be made to intervene as occasion demands in manufacture of the above-mentioned layered product between each resin layer. As such adhesive resin, carboxylic acid, a carboxylic anhydride, carboxylate, 1 thru/or 700 milliequivalents (meq) / 100g resin, and the thermoplastics especially contained by the concentration of 10 thru/or 500 meq (s)/100g resin are mentioned to a main chain or a side chain in the carbonyl (-CO-) basis based on carboxylic amide, carboxylate, etc. The suitable example of adhesive resin An ethylene-acrylic acid copolymer, an ion bridge construction olefine copolymer, They are one sort or two sorts or more of combination, such as maleic anhydride graft polyethylene, maleic anhydride graft polypropylene, acrylic acid graft polyolefin, an ethylene-vinylacetate copolymer, copolymerized polyester, and copolymerization polyamide. These resin is useful to lamination by simultaneous extrusion or a sandwiches lamination. Thermosetting adhesive resin, such as an isocyanate system or an epoxy system, is also used for adhesion lamination with the gas-barrier-property resin film and the damp-proof resin film which were **** formed.

[0049]In the wrapping and the container which are used for this invention, as for the thickness of an oxygen uptake nature resin composition, especially although there is no restriction in particular, it is preferred that there are generally 3 thru/or 100 micrometers in the range of 5 thru/or 50 micrometers. Namely, when it becomes thinner than the range with the thickness of an oxygen uptake nature resin composition, oxygen uptake performance is inferior, It is because there is no exceptional advantage in respect of oxygen uptake nature and it becomes disadvantageous in respect of the container characteristic of points of economical efficiency -- a resin amount increases -- and the flexibility of material and pliability falling, even if it becomes thicker than a certain range.

[0050]In the multilayer wrapping and container of this invention, although the whole thickness is different also by a use, Generally, it is especially good to be [50 thru/or 5000-micrometer],

and, on the other hand, it is appropriate for especially the thickness of the interlayer of an oxygen uptake nature resin composition to consider [30 thru/or 7000-micrometer] it as 1 thru/or 50% of thickness 0.5 thru/or 95% of the whole thickness.

[0051]The wrapping and the container of this invention can be manufactured by a publicly known method in itself, if the point using the oxygen uptake nature resin composition mentioned above is removed. For example, shaping of a film, a sheet, or a tube is performed by extruding in predetermined shape through T-die, a circular die (ring die), etc., after carrying out melt kneading of said resin composition with an extrusion machine, and the T-die method film, a BUROUN film, etc. are obtained. When a T die film carries out biaxial stretching of this, a biaxially oriented film is formed. After carrying out melt kneading of said resin composition with a catapult, a container and preforming for container manufacture are manufactured by ejecting in an ejection metallic mold. A container and preforming for container manufacture are manufactured by letting an extrusion machine pass, extruding said resin composition to fixed molten resin lumps, and carrying out compression molding of this with a metallic mold. The molded product can take forms, such as a film, a sheet, a bottle, parison for tube formation or a pipe, a bottle, or preforming for tube shaping. The pinch-off of the extrusion thing is carried out with the split mold of a couple, and formation of the bottle from parison, a pipe, or preforming is easily performed by blowing a fluid into the inside. After cooling a pipe or preforming, heat to extension temperature and it extends to shaft orientations, and an extension blow bottle etc. are obtained by carrying out blow extension by hydrostatic pressure in a hoop direction. The cover material which consists of containers, or a film thru/or sheets, such as cup shape and the shape of a tray, is obtained by giving a film thru/or a sheet to means, such as vacuum forming, pressure forming, bulging, and plug assist forming.

[0052]Although wrapping, such as a film, can be used as a packaging bag of various gestalten, the bag manufacture can be performed by the publicly known manufacturing-bags method in itself and the usual pouches of a three way type or a four-quarters seal, pouches with a gusset, standing pouches, a pillow packing bag, etc. are mentioned, It is not limited to this example.

[0053]What is necessary is just to perform extrusion molding like the above except being able to use a publicly known coextrusion process for manufacture of a multilayer extrusion Plastic solid in itself, for example, using a multilayer multiplex die using the extrusion machine of the number according to the kind of resin. For manufacture of a multilayer injection-molding object, a multilayer injection-molding object can be manufactured by the co-injecting method or a serial radiation method using the injection molding machine of the number according to the kind of resin. For manufacture of a multilayer film or a multilayered sheet, a multilayer film or a sheet can also be manufactured by the dry lamination of the extrusion coat method and the film which could use the sandwiches lamination and was formed beforehand.

[0054]The wrapping and the container of this invention are useful as a container which can

prevent the flavor fall of the contents by oxygen. As contents with which it can be filled up, by a drink, beer, wine, fruit juice, With foodstuffs, carbonic acid soft drink etc. Fruit, nuts, vegetables, processed meat, small-child foodstuffs, Although contents articles etc. which are easy to cause degradation under oxygen existence, such as drugs, cosmetics, and gasoline, in others, such as coffee, jam, mayonnaise, catsup, cooking oil, a dressing, sauce, food boiled down in soy, and dairy products, are mentioned, it is not limited to these examples.

[0055]

[Example]Although the following example explains this invention further, this invention is not restricted to these examples.

[0056](Measurement of terminal amino group concentration (AEG)) After dissolving 0.6 mg of samples in 50 ml of phenol / ethanol mixed solutions (volume ratios 4/1), 20 ml of ethanol / water mixed solvents (volume ratios 3/2) were added, and it titrated under stirring. 1 / 200N chlorideethanol / water mixing normal solution (volume ratios 1/9) was used for titrant, and the Methyl Orange was used for the indicator. Operation same for not adding a sample was performed and it was considered as blank measurements. From this titration value, terminal amino group concentration (AEG) was calculated using the following formulas. When the transition metal system catalyst was included in the sample, it asks for AEG' which was made to dissolve only tales doses of catalysts and was titrated, and the value which deducted this was set to AEG of a sample.

$$\text{AEG}(\text{eq}/10^6\text{g}) = [(V - V_0) \times N \times f] / W \times 10^3 - \text{AEG}'$$
 V: 1 / 200N chlorideethanol / the amount of water mixing normal solutions (volume ratios 1/9) which sample titration took (ml)

V_0 : 1 / 200N chlorideethanol / the amount of water mixing normal solutions (volume ratios 1/9) which blank titration took (ml)

N: Normality f of ethanol / water mixing normal solution : factor W:sample serious consideration (g) of a normal solution

AEG': Correction value (when the transition metal system catalyst is included in the sample)

[0057](Measurement of the oxygen transmission quantity of a multilayer film) 1 cc of water was put into PP / cup like container made from a steel foil lamination with a content volume of 52.0 ml (high RETOFU REXX by Toyo Seikan Kaisha, Ltd.), and it heat sealed under a nitrogen atmosphere by using a multilayer film as a cover material. After performing processing nothing or boiling treatment for 95 °C and 30 minutes for these cups, keeping it in RH 30 % and 80% -- gas chromatography (GC-8 AIT) GC-3BT: The oxygen density in a cup was both measured using the Shimadzu make, detector:TCD (100 °C), the column:molecular sieve 5A (60 °C), and carrier gas:argon, and oxygen transmission quantity was calculated from this oxygen density.

[0058](Measurement of the oxygen transmission quantity of a multilayered container) 3 cc of water was put into the multilayered container, and it heat sealed with the cover material

containing aluminum under a nitrogen atmosphere. Processing nothing or boiling treatment for 85 °C and 30 minutes was performed, these multilayered containers were kept in RH 30 % and 80%, the oxygen density in a multilayered container was measured using said gas chromatography, and oxygen transmission quantity was calculated from this oxygen density.

[0059][Example 1] As opposed to the polymetaxylylene adipamide resin (the Toyobo Co., Ltd. make T-600, AEG=87eq/10⁶g) which opened water vaporproofing packaging and was dried for 4 hours under 1 or less mmHg of pressures, and temperature the conditions of 150 °C, Maleic acid denaturation polybutadiene (M-2000-20 made from Nippon Oil Chemicals) as an oxidizing organic component 5 % of the weight, The 20-micrometer-thick film was fabricated for the resin composition which contains 400 ppm of neo decanoic acid cobalt (DICNATE5000 by Dainippon Ink & Chemicals, Inc.) by cobalt volume conversion as a transition metal system catalyst at the T-die temperature of 270 °C using the T-die extrusion machine (made by Toshiba Machine Co., Ltd.). On one side of this film, the laminating machine was used [12-micrometer-thick biaxial extension polyester film] for other fields for 50-micrometer-thick unextended polypropylene, and the multilayer film was fabricated as dry laminate. The oxygen transmission quantity into the container after heat sealing this multilayer film to the opening of said high RETOFU REXX and keeping it for 30 days on condition of RH 30 % and 80% to it was measured.

[0060][Example 2] It fabricates on the same conditions as Example 1 except [all] said neo decanoic acid cobalt being 310 ppm by cobalt volume conversion as an oxidizing organic component by making hydroxyl group end polyisoprene (poly ip made from Idemitsu Petrochemistry) into 5 % of the weight and a transition metal system catalyst, The oxidation transmission quantity into a container was measured.

[0061][Example 3] Except [all] setting AEG concentration of polymetaxylylene adipamide resin to 52eq/10⁶g, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0062][Example 4] Except [all] said neo decanoic acid cobalt being 200 ppm by cobalt volume conversion as a transition metal system catalyst, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0063][Example 5] Except [all] making quantity of hydroxyl group end polyisoprene into 3 % of the weight as an oxidizing organic component, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0064][Example 6] Except [all] making quantity of maleic acid denaturation polybutadiene into 8 % of the weight as an oxidizing organic component, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0065][Comparative example 1] Except [all] setting AEG concentration of polymetaxylylene

adipamide resin to 27eq/10⁶g, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0066][Comparative example 2] Except [all] neo decanoic acid cobalt being 80 ppm by cobalt volume conversion as a transition metal system catalyst, it fabricated on the same conditions as Example 1, and the oxygen transmission quantity into a container was measured.

[0067][Comparative example 3] It fabricated on the same conditions as Example 1 except [all] making quantity of maleic acid denaturation polybutadiene into 12 % of the weight as an oxidizing organic component. The above measurement result is shown in Table 1.

[0068]

[Table 1]

	酸素透過量 (cc/容器)		成形性
	処理なし	ボイル処理	
実施例 1	0	0	良好
実施例 2	0.15	0.15	良好
実施例 3	0	0	良好
実施例 4	0	0	良好
実施例 5	0.12	0.12	良好
実施例 6	0	0	良好
比較例 1	0.26	0.36	良好
比較例 2	0.25	0.37	良好
比較例 3	—	—	製膜不可

[0069][Example 7] The terminal amino group concentration AEG receives polymetaxylylene adipamide resin of 87eq/10⁶g, The resin composition which contains 310 ppm of neo decanoic acid cobalt for maleic acid denaturation polybutadiene by cobalt volume conversion 5% of the weight The extrusion machine for interlayers, The extrusion machine for inside-and-outside layers and the maleic acid denaturation ethylene-butene-1 copolymer were supplied for polyethylene terephthalate resin to the extrusion machine for adhesives, respectively, and the multilayered sheet with a multilayer die temperature of 270 ** was created. The cup like container whose lamination is 150 mm in height, a diameter of the regio oralis of 60 mm, and 300 ml of inner capacity about this multilayered sheet in 120 micrometers of 20 micrometers of 20 micrometers of 20 micrometers of 120 micrometers of inner layers / glue lines / interlayers / glue lines / outer layers was created by the plug assist pressure-forming method. The oxygen transmission quantity into the container after heat sealing the sealed lid which laminated

aluminum foil to the regio oralis of this container and keeping it for 30 days on condition of 30 ** and 80%RH to it was measured.

[0070][Example 8] Polyethylene terephthalate resin of intrinsic viscosity 0.83 dl/g to the catapult for inside-and-outside layers. To the polymetaxylylene adipamide resin (the Toyobo Co., Ltd. make T-600, AEG=87eq/10⁶g) which carried out the drying process to Example 1 on the conditions. As an oxidizing organic component, as 5 % of the weight of maleic anhydride denaturation polybutadienes (M-2000-20 made from Nippon Oil Chemicals), and a transition metal system catalyst. The pellet which pelletized the resin composition which added 400 ppm of neo decanoic acid cobalt (DICNATE5000 by Dainippon Ink & Chemicals, Inc.) by cobalt volume conversion with the twin screw extruder is supplied to the catapult for interlayers, Coinjection molding of the temperature of an ejection nozzle was carried out into the ejection metallic mold on condition of 280 ** and resin pressure 250 kgf/cm², and two-sort the multilayer preform of three layers whose inside-and-outside layer is polyethylene terephthalate resin and whose interlayer is polymetaxylylene adipamide resin was fabricated. The rate of 32 g and an interlayer of the metsuke amount of this multilayer preform was 5 % of the weight. The biaxial extension blow was carried out within the metallic mold which heated this multilayer preform at 110 **, and was heated at 150 **, and inner capacity fabricated a 500-cc Multi-layer bottle. After having sealed the regio oralis of this Multi-layer bottle, performing 85 ** and boiling treatment for 30 minutes and keeping it on condition of 30 ** and 80%RH on the 60th, measurement of the oxygen density in a container was performed.

[0071][Example 9] The multilayer preform was fabricated on the same conditions as Example 10, the biaxial extension blow of this multilayer preform was carried out within the metallic mold heated at 60 **, and inner capacity fabricated a 500-cc Multi-layer bottle. After sealing the regio oralis of this Multi-layer bottle and keeping it on condition of 30 ** and 80%RH on the 60th, measurement of the oxygen density in a container was performed. The above measurement result is shown in Table 2.

[0072]

[Table 2]

	酸素透過量 (cc/容器)		成形性
	処理なし	ボイル処理	
実施例 7	0	—	良好
実施例 8	—	0	良好
実施例 9	0	—	良好

[0073]

[Effect of the Invention]Polyamide resin is used as a substrate, and oxygen uptake nature can be made it to be the feature to have blended the oxidizing organic component and the transition metal system catalyst with this, and to reveal in the oxygen uptake nature resin composition of this invention, without producing the fall of the oxygen barrier property by the oxidation degradation of polyamide resin. Namely, since oxygen uptake is chiefly performed for an oxidizing organic component by this in response to oxidation in the oxygen uptake nature resin composition of this invention, without a polyamide resin substrate oxidizing on parenchyma, It becomes possible to make oxygen uptake nature reveal, without producing the fall of the oxygen barrier property by the oxidation degradation of polyamide resin. In this invention, maintenance of the oxygen barrier property by polyamide resin and the manifestation of the oxygen uptake nature by an oxidizing organic component are performed on the functional separation target in this way.

[0074]In this invention, it can control the oxidation degradation of polyamide resin that polyamide resin is [the terminal amino group concentration of more than $40\text{eq}/10^{-6}\text{g}$] polyamide resin in which terminal amino group concentration exceeds $50\text{eq}/10^{-6}\text{g}$ much more suitably.

[0075]As for the oxidizing organic component used for this invention, it is preferred that they are the polymer derived from polyenes, especially an acid denaturation polyene system polymer. With the polymer derived from polyene, drawing of a hydrogen atom is easily performed in the position of the carbon atom which adjoins the carbon-carbon double bond in a polymer, and it is thought that a radical occurs by this. Oxygen uptake in the constituent containing a transition metal system catalyst and the above-mentioned oxidizing organic component is performed via oxidation of this organic component with a natural thing. There is an advantage that the rate of absorption of oxygen and the absorption capacity of oxygen are large.

[0076]Under coexistence of a small amount of transition metal catalysts which do not produce degradation of resin in a normal state, either, Although there is an induction period in generating of the above-mentioned radical, and addition of oxygen and these elementary processes are not necessarily performed promptly and effectively, in the acid denaturation polyene polymer suitably used by this invention. In addition to the above-mentioned double bond contiguity carbon atom, it has functional groups, such as a carboxylic acid group and carboxylic anhydride groups, and is useful effective in shortening of said induction period. In addition, if an acid denaturation polyene polymer is blended with polyamide resin, the very convenient operation that the dispersibility over the acid denaturation polyene system polymer to a polyamide resin matrix improves, and the processability of a resin composition improves will be attained.

[Translation done.]